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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/784,055	02/20/2004	Robert E. Buxbaum	REB-13602/01	6857

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EXAMINER	
WARTALOWICZ, PAUL A	
ART UNIT	PAPER NUMBER
1735	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/784,055	BUXBAUM, ROBERT E.	
	Examiner	Art Unit	
	PAUL WARTALOWICZ	1735	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 November 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *16,17,25,27,29,30 and 32* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *16,17,25,27,29,30 and 32* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/08/2011 has been entered.

Response to Arguments

Applicant's arguments filed 01/08/2011 have been fully considered but they are not persuasive.

Applicant argues that Autenrieth teaches away from the simplicity of the present invention with respect to a product gas pump, expander unit and driving motor, serially connected air pump and anode waste gas compressor. Applicant similarly argues that Thompson teaches away from the simplicity of the present invention with respect to a recycle compressor included in the method.

However, it appears that the product gas pump, expander unit and driving motor, serially connected air pump and anode waste gas compressor of Autenrieth and the recycle compressor of Thompson can be eliminated with a predictable loss of the function of that step. Ex parte Wu , 10 USPQ 2031 (Bd. Pat. App. & Inter. 1989) (Claims at issue were directed to a method for inhibiting corrosion on metal surfaces using a composition consisting of epoxy resin, petroleum sulfonate, and hydrocarbon

diluent. The claims were rejected over a primary reference which disclosed an anticorrosion composition of epoxy resin, hydrocarbon diluent, and polybasic acid salts wherein said salts were taught to be beneficial when employed in a freshwater environment, in view of secondary references which clearly suggested the addition of petroleum sulfonate to corrosion inhibiting compositions. The Board affirmed the rejection, holding that it would have been obvious to omit the polybasic acid salts of the primary reference where the function attributed to such salt is not desired or required, such as in compositions for providing corrosion resistance in environments which do not encounter fresh water. MPEP 2144.04 (II).

In the instant case, it is well known that compressing, pumping, subjecting to driving motors change the pressure and/or flow rate of the fluids acted upon by those steps. It would have been obvious to one of ordinary skill in the art at the time applicant's invention was made would have removed these steps based on the desired end process such as the pressure and/or flow rate of the fluids at various points in the process. It does not appear that the removal of the pumping, compressing, or expanding steps result in an unpredictable result.

In addition, it is unclear why Autenrieth and Thompson necessarily carry with them the complexity and reliance on pumps and compressors. The process of Holliday consists of the process steps claimed wherein Autenrieth and Thompson are relied upon only for the limitations in the claims not taught by Holliday.

Additionally, none of Goebel, LaPierre, or Devries are relied upon to cure the teaching away of Autenrieth and Thompson with respect to claim 16. In response to

applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In the instant case, it is well known that compressing, pumping, subjecting to driving motors change the pressure and/or flow rate of the fluids acted upon by those steps. It would have been obvious to one of ordinary skill in the art at the time applicant's invention was made would have removed these steps based on the desired end process such as the pressure and/or flow rate of the fluids at various points in the process. It does not appear that the removal of the pumping, compressing, or expanding steps result in an unpredictable result.

Claim Rejections - 35 USC § 112

The following is a quotation of the fourth paragraph of 35 U.S.C. 112:

Subject to the [fifth paragraph of 35 U.S.C. 112], a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

Claim 25 is rejected under 35 USC 112, 4th paragraph as claim 25 does not contain a reference to a claim previously set forth (claim 25 is dependent on canceled claim 21). Claim 25 will be treated as if dependent on claim 16 for the purposes of examination.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 16-17, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holladay (US 2003/0091502) in view of Autenrieth (US 6423435).

Holladay teaches a process for forming hydrogen from a feedstock (para. 0018) consisting of the steps of: pumping a liquid feedstock (para. 0109, 0110), preheating and boiling said feedstock (para. 0052), providing said feedstock to an endothermic reaction (steam reforming) reactor operating within a normative control range of temperature of between 200-500°C (para. 0096), wherein the feedstock undergoes an endothermic reaction (steam reforming) to yield hydrogen and an endothermic reaction product (para. 0094).

Additionally, Holladay teaches that the reformate is subjected to purification such as a hydrogen permeable membrane (secondary stage membrane reactor) (para. 0094), but fails to teach collecting from said secondary stage membrane reactor a

purified hydrogen flow passing through a membrane of secondary stage membrane reactor to a purified hydrogen side and a raffinate gas stream.

Autenrieth, however, teaches a method of making hydrogen in a fuel cell system arrangement (col. 1) wherein an effluent from a reformer is sent to a membrane reactor comprising a water gas shift reaction for the purpose of generating additional hydrogen (col. 4, lines 400-51) and a residual conversion gas which is not separated (raffinate) (col. 3, lines 45-55).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicants invention was made to provide a membrane reactor comprising a water gas shift reactor in Holladay as in order promote a water gas shift reaction and purification of hydrogen product as taught by Autenrieth and because Holladay teaches using membrane purification (para. 0094).

To the extent that the phrase "consisting of" closes the claims to additional steps and that the secondary references require requisite steps outside the scope of the claims, it appears that the product gas pump, expander unit and driving motor, serially connected air pump and anode waste gas compressor of Autenrieth can be eliminated with a predictable loss of the function of that step. Ex parte Wu , 10 USPQ 2031 (Bd. Pat. App. & Inter. 1989). It is well known that compressing, pumping, subjecting to driving motors change the pressure and/or flow rate of the fluids acted upon by those steps. It would have been obvious to one of ordinary skill in the art at the time applicant's invention was made would have removed these steps based on the desired end process such as the pressure and/or flow rate of the fluids at various points in the

process. It does not appear that the removal of the pumping, compressing, or expanding steps result in an unpredictable effect.

Regarding claim 17, Holladay teaches that the feedstock is preheated within a pump supplied boiler (vaporizer) (para. 0052, 0109, 0110).

Regarding claim 27, Holladay fails to teach that the secondary stage membrane reactor operates at a lower temperature than said reactor.

Autenrieth teaches that the water gas shift membrane reactor is operated at a temperature of less than 350℃ (col. 5, lines 40-50).

Therefore, it would have been obvious to one of ordinary skill in the art to operate the membrane water gas shift reactor at a temperature of less than 350 C in Holladay in order to operate membrane gas shift reactor at a known temperature as taught by Autenrieth.

Additionally, Holladay teaches that the reactor is operated at a temperature of 200-500 C (para. 0096). As the reactor is operated at a temperature of 200-500 C (para. 0096) and the membrane water gas shift reactor is operated at less than 350 C, the membrane water gas shift reactor is operated at a lower temperature than the reactor.

Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Holladay (US 2003/0091502) in view of Autenrieth (US 6423435) in further view of Goebel (US 2003/0093949).

Holladay, Autenrieth teach a method as described above in claim 16, but fail to teach providing the combustion gas to burn stoichiometrically with the feedstock.

Autenrieth teaches that the residual conversion gas not separated is burned to produce a waste gas stream for driving a pump unit (col. 3, lines 45-60).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide residual conversion gas not separated in Holladay burned in order to produce a waste gas stream for driving a pump unit (col. 3, lines 45-60) as taught by Autenrieth.

Holladay teaches that the fuel is burned with air in the combustion reaction (para. 0054).

Goebel teaches a method of reforming (para. 0013) wherein fuel is combusted with a stoichiometric amount of oxygen for the purpose of maximizing heat input by the combustion reaction (para. 0038).

As Holladay teaches that the fuel is burned with air in the combustion reaction (para. 0054) and Goebel teaches a method of reforming (para. 0013) wherein fuel is burned with a stoichiometric amount of oxygen for the purpose of maximizing heat input by combustion (para. 0038), it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide the fuel of Holladay, Autenrieth burned in the combustion reaction with a stoichiometric amount of oxygen in order to maximize heat input to the steam reformer.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Holladay (US 2003/0091502) in view of Autenrieth (US 6423435) and in further view of LaPierre (US 6348278).

Holladay, Autenrieth teach a method as described above in claim 16.

If Holaday and Autenrieth fail to teach that the secondary stage membrane reactor operates at a lower temperature than said reactor, LaPierre teaches that hydrogen permeable membranes should be operated at temperatures of 300-450 C (col. 14, lines 1-10).

Autenrieth teaches that the water gas shift membrane reactor is operated at a temperature of less than 350℃ (col. 5, lines 40-50).

Therefore, it would have been obvious to one of ordinary skill in the art to operate the membrane water gas shift reactor of Holladay, Autenrieth at a temperature of 300-350 C in order to operate membrane gas shift reactor at a temperature compatible with both the shift reaction as taught by Autenrieth and the membrane component of the membrane water gas shift reactor as taught by LaPierre.

Additionally, Holladay teaches that the reactor is operated at a temperature of 200-500 C (para. 0096). As the reactor is operated at a temperature of 200-500 C (para. 0096) and the membrane water gas shift reactor is operated at 300-350 C, the membrane water gas shift reactor is operated at a lower temperature than the reactor.

Claims 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Holladay (US 2003/0091502) in view of Autenrieth (US 6423435) and Sanger (US 6190623) and Thompson (US 5281253).

Holladay teaches a process for forming hydrogen from a feedstock (para. 0018) consisting of the steps of: pumping a liquid feedstock (para. 0109, 0110), preheating and boiling said feedstock (para. 0052), providing said feedstock to an endothermic reaction (steam reforming) reactor operating within a normative control range of temperature of between 200-500°C (para. 0096), wherein the feedstock undergoes an endothermic reaction (steam reforming) to yield hydrogen and an endothermic reaction product (para. 0094).

Additionally, Holladay teaches that the reformate is subjected to purification such as a hydrogen permeable membrane (secondary stage membrane reactor) (para. 0094), but fails to teach collecting from said secondary stage membrane reactor a purified hydrogen flow passing through a membrane of secondary stage membrane reactor to a purified hydrogen side a raffinate.

Autenrieth, however, teaches a method of making hydrogen in a fuel cell system arrangement (col. 1) wherein an effluent from a reformer is sent to a membrane reactor comprising a water gas shift reaction for the purpose of generating additional hydrogen (col. 4, lines 400-51) and a residual conversion gas which is not separated (raffinate) (col. 3, lines 45-55).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicants invention was made to provide a membrane reactor comprising a water

gas shift reactor in Holladay as in order promote a water gas shift reaction and purification of hydrogen product as taught by Autenrieth and because Holladay teaches using membrane purification (para. 0094).

Holladay fails to teach modifying the speed of the feedstock entering the reactor in response to sensing a pressure on a purified hydrogen side of secondary stage membrane reactor.

Thompson teaches a method for controlling systems of membranes (col. 1) wherein an inlet to a membrane system is adjusted based upon the pressure and/or flow rate (output) of the outlet (permeate side) of a membrane system for the purpose of raising or lowering the product pressure as needed (col. 3).

Sanger teaches a reforming method (col. 1) comprising adjusting the feedstock flow to the steam reformer, first entering pre-processing, for the purpose of meeting the downstream demands for electrical power (col. 11, lines 15-25).

As Thompson teaches an inlet to a membrane system is adjusted based upon the pressure of the outlet (permeate side) of a membrane system for the purpose of raising or lowering the product pressure as needed (col. 3) and Sanger teaches adjusting the feedstock flow to the steam reformer, first entering pre-processing, for the purpose of meeting the downstream demands for electrical power (col. 11, lines 15-25), it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to control the speed (flow) of the feedstock entering the reactor of Holladay in response to the pressure (output) of the hydrogen on the permeate side of

the membrane in order to raise or lower the product stream pressure as needed (col. 3) and to meet downstream demands for electrical power.

Additionally, it appears that the product pressure (output) is the sole means of increasing or decreasing flow rate of the reactants to the reactor (Thompson, col. 3, lines 30-56).

To the extent that the phrase "consisting of" closes the claims to additional steps and that the secondary references require requisite steps outside the scope of the claims, it appears that the product gas pump, expander unit and driving motor, serially connected air pump and anode waste gas compressor of Autenrieth and the recycle compressor of Thompson can be eliminated with a predictable loss of the function of that step. Ex parte Wu , 10 USPQ 2031 (Bd. Pat. App. & Inter. 1989). It is well known that compressing, pumping, subjecting to driving motors change the pressure and/or flow rate of the fluids acted upon by those steps. It would have been obvious to one of ordinary skill in the art at the time applicant's invention was made would have removed these steps based on the desired end process such as the pressure and/or flow rate of the fluids at various points in the process. It does not appear that the removal of the pumping, compressing, or expanding steps result in an unpredictable effect.

Regarding claim 30, Holladay teaches that the reactor carries out endothermic steam reforming (para. 0067). Therefore, the reactor is an endothermic reactor.

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Holladay (US 2003/0091502) in view of Autenrieth (US 6423435) in further view of DeVries (US 2004/0065013).

Holladay, Autenrieth teach a method as described above in claim 16, but fail to teach that the feed is preheated by heat exchange with the hydrogen output of said membrane reactor.

DeVries, however, teaches a steam reforming method (para. 0001) wherein hydrogen output out of a hydrogen permeable membrane is used to preheat a feedstock (claim 18; para. 0090, 0104) for the purpose of efficiently using heat produced by the system (para. 0090, 0104).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide hydrogen output out of the hydrogen membrane reactor used to preheat the feedstock (claim 18; para. 0090, 0104) of Holladay, Autenrieth in order to efficiently using heat produced by the system (para. 0090, 0104) as taught by DeVries.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PAUL WARTALOWICZ whose telephone number is (571)272-5957. The examiner can normally be reached on 8:30-6 M-Th and 8:30-5 on Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jessica L. Ward can be reached on (571) 272-1223. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Paul A Wartalowicz/
Primary Examiner, Art Unit 1735